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**Accumulation and Fate of Perchlorate in Plants**

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**Abstract**

Perchlorate, a component of solid rocket fuels, has emerged as a potential threat to surface water and groundwater at several locations in the U.S. Perchlorate levels up to 16 ug/L were detected in Lake Mead and 5-9 ug/L in the lower Colorado River. The water from the Colorado River is used for irrigation to raise food crops each year. One-half of the populations of Nevada, Arizona and California use drinking water from the affected Colorado River. The drinking, and uptake and translocation of perchlorate through the food chain during irrigation with perchlorate contaminated waters could represent a human exposure problem.

Due to the expense and lack of widespread applicability of the standard treatment methods for perchlorate (reverse osmosis, ion exchange, and similar approaches), the US Air Force requested that we investigate the phytoremediation of perchlorate. From the screening of a range plant – 13 trees and terrestrial and wetland herbs – we found that:

- Poplar and willow trees, French tarragon, and pickleweed (a playa halophyte) actually break down perchlorate into chloride
- Willow and eucalyptus stimulate rhizosphere degradation of perchlorate
- Lettuce and other plants temporarily accumulate perchlorate up to 0.18% in 10 days
- Some freshwater wetland plants experienced toxic effects, perhaps due to chloride exchange from sand substrates

Competitive ions (especially chlorides), nutrients, and soil exchange, influence degradation rates, accumulation, and phytotoxicity. Accumulation is focussed in the leaf tips of some plants. Location of the point of degradation awaits radiolabeled mass balance experiments and more complete product analysis in the plant. Once full mass balances and kinetics investigations of irrigation and other water and soil influences are undertaken, discovery of other effects is anticipated.

These preliminary screening results indicate that created wetlands or pumping contaminated ground or surface waters on tree and other plantations may cost effectively

remove perchlorate. However, additional process investigation and then pilot testing is necessary to establish practicality.